

CLAIMS

1. A nitride semiconductor device comprising a substrate of yttria stabilized zirconia, referred to below as YSZ, and a nitride semiconductor layer including an InN crystal of the hexagonal system, said InN crystal being oriented with the c-axis thereof approximately vertical with respect to the (111) plane of said YSZ substrate.
2. The nitride semiconductor device according to claim 1 wherein an atomic step is formed on the (111) plane of said YSZ substrate.
3. A nitride semiconductor device comprising a ZnO substrate, and a nitride semiconductor layer including a GaN crystal of the hexagonal system, said GaN crystal being oriented with the c-axis thereof approximately vertical with respect to the (000-1) plane or the (0001) plane of said ZnO substrate.
4. The nitride semiconductor device according to claim 3 wherein an atomic step is formed on the (000-1) plane or on the (0001) plane of said ZnO substrate.
5. A nitride semiconductor device comprising a ZnO substrate, and a nitride semiconductor layer including an $In_xGa_{1-x}N$ ($0 \leq x \leq 0.4$) crystal of the hexagonal system, said $In_xGa_{1-x}N$ crystal being oriented with the c-axis thereof approximately vertical with respect to the (000-1) plane or the (0001) plane of said ZnO substrate.
6. A method for the preparation of a nitride semiconductor device having a nitride semiconductor layer formed of InN, comprising
a vapor depositing step of vapor depositing said InN on the (111) plane of a

substrate of yttria stabilized zirconia, referred to below as YSZ.

7. The method for the preparation of a nitride semiconductor device according to claim 6 wherein, in said vapor deposition step, said InN is grown epitaxially in accordance with a physical vapor deposition (PVD) method or a chemical vapor deposition (CVD) method.

8. The method for the preparation of a nitride semiconductor device according to claim 6 further comprising

a step of forming an atomic step in advance on said (111) plane of said YSZ substrate;

said InN being vapor-deposited in said vapor depositing step on the YSZ substrate on which said atomic step has been formed.

9. The method for the preparation of a nitride semiconductor device according to claim 8 wherein the YSZ substrate having crystal orientation in the (111) plane is heated at a temperature not lower than 800°C.

10. A method for the preparation of a nitride semiconductor device having a nitride semiconductor layer formed of GaN, comprising

a vapor depositing step of vapor depositing GaN on the (000-1) plane or the (0001) plane of a ZnO substrate at a temperature not higher than 510°C.

11. The method for the preparation of a nitride semiconductor device according to claim 10 wherein, in said vapor deposition step, said GaN is grown epitaxially in accordance with a physical vapor deposition (PVD) method or a chemical vapor

deposition (CVD) method.

12. The method for the preparation of a nitride semiconductor device according to claim 10 further comprising

a step of forming an atomic step in advance on said (000-1) plane or the (0001) plane of said ZnO substrate;

said GaN being vapor-deposited in said vapor depositing step on the ZnO substrate on which said atomic step has been formed.

13. The method for the preparation of a nitride semiconductor device according to claim 12 wherein, in said step forming step, the ZnO substrate, having crystal orientation in the (000-1) plane or in the (0001) plane, is encircled with sintered ZnO and heated in this state to a temperature not lower than 800°C.

14. The method for the preparation of a nitride semiconductor device according to claim 12 wherein, in said step forming step, the ZnO substrate, having crystal orientation in the (000-1) plane or in the (0001) plane, is encircled with a Zn containing material and heated in this state to a temperature not lower than 800°C.

15. The method for the preparation of a nitride semiconductor device according to claim 10 wherein, in said vapor deposition step, GaN is vapor-deposited at ambient temperature.

16. A method for the preparation of a nitride semiconductor device having a nitride semiconductor layer formed of $In_xGa_{1-x}N$ ($0 \leq x \leq 0.4$), comprising
a vapor depositing step of vapor depositing said $In_xGa_{1-x}N$ on the (000-1)

plane or the (0001) plane of a ZnO substrate at a temperature not higher than 510°C.

17. A semiconductor substrate comprising a yttria stabilized zirconia on the (111) plane of which an atomic step has been formed.

18. A semiconductor substrate comprising a ZnO substrate on the (000-1) plane or the (0001) plane of which an atomic step has been formed.

19. A method for the preparation of a nitride semiconductor substrate comprising a step of heating a substrate of yttria stabilized zirconia having crystal orientation in the (111) plane at a temperature not lower than 800°C.

20. A method for the preparation of a nitride semiconductor substrate comprising a step of encircling a ZnO substrate having crystal orientation in the (000-1) plane or in the (0001) plane with sintered ZnO and heating the substrate in this state at a temperature not lower than 800°C.

21. A method for the preparation of a nitride semiconductor substrate comprising a step of encircling a ZnO substrate having crystal orientation in the (000-1) plane or in the (0001) plane with a Zn -containing material and heating the substrate in this state at a temperature not lower than 800°C.